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ABSTRACT

Seventeen medical school students who participated in a commercial test preparation course were matched with 17 other students judged to be of equal ability. These two groups were compared on the basis of their scores on Part I of the National Board of Medical Examiners (NBME). The two groups were matched closely on both the grade point average for the first two years of medical school and scores on a pretest. Students who took the commercial course scored significantly higher on Part I and 16 of the 17 passed, whereas 9 of the control group failed. Questionnaire and interview results indicated that: (1) students were motivated to take the course by fear of failure on the examination; (2) the course offered a well organized approach to condensing two years of study and concentrated on information relevant to the examination; and (3) that instruction in test-taking techniques was not among the most valuable features of the course. (CTM)

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THE INFLUENCE OF COMMERCIAL TUTORING ON PART I NATIONAL MEDICAL BOARD PERFORMANCE

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Abstract - Seventeen students at the University of Alabama in Birmingham prepared for the June, 1977, NBME, Part I by participating in a commercial test preparation course. These students were found to have significantly higher Part I scores than comparable students matched by basic science GPA and Pretest® scores. Results indicated that the commercial course was particularly influential in raising the Part I scores of students who were identified as potential Part I failures. Results of a survey of the commercial students are also presented.

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INTRODUCTION

As increasing numbers of able students compete for the limited number of vacancies in prestige schools and prestige professions, the emphasis upon entrance and licensure examinations increases. Given the facts of rampant grade inflation and relatively wide disparity in the quality of secondary and undergraduate institutions, admissions committees are hard pressed to select the best qualified candidates from a large pool of applicants. Therefore, in an attempt to somewhat negate the influence of grade point average (GPA), admissions committees are placing increased emphasis upon standardized examinations. High marks on examinations such as: SAT, GRE, LSAT, MCAT, or NBME, may determine whether an applicant is admitted to the school or profession of his choice, and whether he is licensed to practice his profession. Nowhere is the admissions problem more acute than in medical schools. In the 1975-76 academic year, 42,303 students made 366,040 applications for the 14,910 first year slots in medical schools (1). It is no surprise, therefore, that significant numbers of applicants turn to commercial companies for courses specifically designed to increase scores on standardized examinations.

In addition to the entrance hurdle, approximately forty percent of the U.S. medical schools require their students to pass Part I of the National Board of Medical Examiners (NBME) in order to progress from the second to third year of medical school. The NBME, Part I is a norm-referenced exam with the mean set at 500 and the standard deviation set at 100. A score of 380 is required for passing, thereby ensuring that ten-to-eleven percent will fail

each exam. It is apparent that this is a highly competitive exam with serious consequences for failure, therefore, examination preparation is crucial.

In order to prepare for the June 1977 NBME, Part I exam, seventeen medical students from the University of Alabama in Birmingham (UAB) enrolled in a commercial test preparation course. The remaining 127 UAB students who took the exam prepared for the Boards on their own in the traditional manner (non-commercial). The present ex post facto study was designed to ascertain the effects of the commercial test preparation course on NBME, Part I scores.

The commercial course consisted of a series of audio tapes and written materials. The tapes were organized around items in the NBME format whereby the narrator would read a multiple choice question and give the possible responses. The student would answer the question, and then the narrator would explain, in detail, the logic associated with the correct response, as well as the faulty logic associated with each of the distractors. Students were expected to understand each practice item before progressing to the next. This entailed considerable supplementary reading and study. The commercial course also provided taped and written instructions in test-taking techniques.

METHOD

Inasmuch as the commercial students tended to have lower basic science GPA's than the class as a whole[1], it was decided to match the commercial students with non-commercial students rather than compare them to a random sample of non-commercial students. Two variables were selected for matching, GPA T-scores and Pretest® scores. The GPA scores were cumulative from the

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[1]Commercial students had a mean GPA T-score of 42.7, nearly 1 standard deviation below the class mean.

first two years of medical school and represented the students' marks in the basic sciences, the same area covered on the Part I exam. The GPA T-scores for the class as a whole correlated with Part I scores at .74[2]. The Pretest scores came from Pretest Incorporated, an exam designed to approximate the NBME. Pretest scores for the class correlated with Part I at .80. Scores on both matching variables were, therefore, highly correlated with Part I scores. Commercial students were matched with control students, first by GPA, and secondly by Pretest. In cases where more than one match was possible, the control students were randomly selected.

RESULTS

Students Matched by GPA T-Scores

The commercial students had a mean GPA T-score of 42.71 and the matched non-commercial students had a mean of 43.06. This difference was not significant at the .05 level. Having therefore established that the 17 non-commercial students were equivalent to the commercial students on basic science GPA, the Part I scores of the two groups were compared.

The commercial students' Part I mean score of 503 was found to be significantly higher than the non-commercial students' score of 434 (Table 1).

Table 1 - Comparison of Part I Scores of Commercial and Non-Commercial Students Matched by GPA T-scores.

	N	Part I Mean	Mean of Diff.	S.E. of Diff.	df	t[3]
Commercial	17	503.24	69.12	22.67	16	3.0492*
Non-Commercial	17	434.12				

*p <.005

[2]The linear correlation for all non-commercial students was .77, and the parabolic correlation for the commercial students was .77.

[3]All tests of significance are directional, dependent t-tests unless otherwise noted.

Using basic science GPA as an indicator of the students' ability level prior to preparation for Part I, it is apparent that students who prepared by the commercial method performed significantly better on Part I than equivalent ability students using the traditional method of preparation.

It was of interest to determine the relative effectiveness of the commercial course for those marginal students who were identified as potential Part I failures. It was previously noted that GPA T-scores correlated at .74 with Part I scores. It is assumed that a T-score of 38 is generally equivalent to a Part I score of 380, therefore, students with T-scores below 38 were considered as potential failures.

Fifteen students were identified as potential failures (7 commercials and 8 non-commercials). Of these, all 7 commercials passed Part I and only 2 non-commercials passed. Of the 4 students who were expected to pass, but failed, 3 were non-commercial and 1 was a commercial[4] (Table 2).

The possibility existed that the 8 non-commercial students in the potential failure group had significantly lower T-scores than the 7 commercial students of the same group. This hypothesis was tested and the T-score means were found to be essentially equal, 34.57 and 34.63 for commercial and non-commercial students respectively. Therefore, the probability of failure, based on T-score, was essentially equal for the two groups. It is of interest to note, therefore, that the potential failure commercials scored significantly higher on Part I than did the potential failure non-commercials (Table 3).

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[4]It is the authors' understanding that the failing commercial student did not participate in the commercial sessions on a regular basis. He did, in fact, repeat the commercial course and pass Part I on the second attempt.

Table 2 - Pass-Fail Matrix for Commercial and Non-Commercial Students

	Failed* (Part I Score <380)	Passed (Part I Score ≥380)
Expected to pass (GPA T-Score ≥38)	N = 4 Commercial = 1 Non-Commercial = 3	N = 123 Commercial = 9 Non-Commercial = 114
Expected to fail (GPA T-Score <38)	N = 6 Commercial = 0 Non-Commercial = 6	N = 9 Commercial = 7 Non-Commercial = 2

Commercial N = 17†

Non-Commercial N = 125††

*No T-Score available for 1 failing student

†Includes 2 students repeating Part I

††Includes 7 students repeating Part I

Table 3 - Comparison of Part I Scores for Commercial and Non-Commercial Students With T-Scores Below 38. (Independent t-Test).

	N	Part I Mean	S.D.	df	t
Commercial	7	454.29	40.36	13	2.9607*
Non-Commercial	8	337.50	89.52		

*p <.01

Figure 1 illustrates the best fitting regression line for predicting Part I scores from T-scores. The reader will note that while the T-score is a relatively strong predictor (r = .74), the commercial students tended to fall above the prediction line, suggesting a strong positive influence of the commercial course. One would expect a random sample of students to fall equally above and below the line.

Students Matched by Pretest

The majority of the entering class of 1975 took the Pretest Incorporated examination in the spring of 1977, prior to preparation for the Part I exam. The Pretest is a standardized examination which was administered to all students at one setting. The Pretest was therefore considered to be another valid measure of the students' relative abilities prior to preparation for Part I.

No Pretest scores were available for the 9 repeating students, 2 of whom were commercial students. One commercial student could not be matched with a non-commercial on the Pretest, and one commercial student did not take the Pretest, leaving 13 of the original 17 commercial students to be matched with non-commercials. The precision of the Pretest matches is illustraied in Table 4, which reveals no significant difference in the Pretest scores of the two groups.

Table 4 - Comparison of Pretest Means for Matched Students

	N	Pretest Mean	Mean of Diff.	S.E. of Diff.	df	t
Commercial	13	500	0.38	0.87	12	0.4402 N.S.
Non-Commercial	13	500.38				

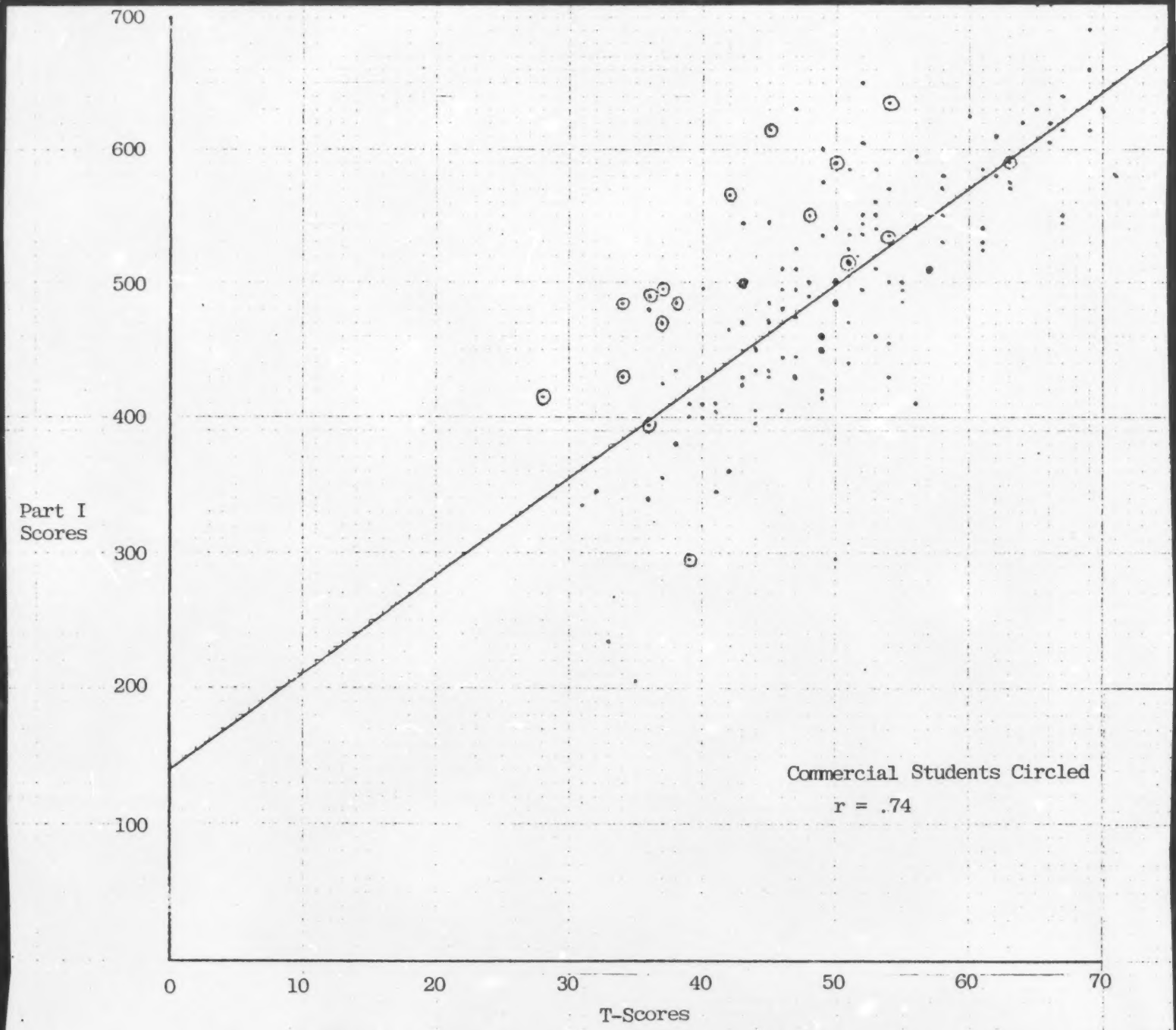


Figure 1 - Line of Best Fit for Predicting Part I Scores from T-Scores

Having established the equivalence of Pretest scores for the matched students, the differences in scores from Pretest to Part I were compared. Table 5 reveals that the 13 commercial students had a mean increase of 24 points from Pretest to Part I, while the non-commercials decreased their mean score by 29 points; this difference was significant at the .005 level.

Table 5 - Comparison of Mean Increases from Pretest to Part I for Matched Students

	N	Mean Increase	Mean of Diff.	S.E. of Diff.	df	t
Commercial	13	24.08	53.69	16.93	12	3.1721*
Non-Commercial	13	− 29.61				

*p <.005

In addition, the Part I means of the commercial and non-commercial students were compared, revealing that the commercial students scored significantly higher on Part I (Table 6).

Table 6 - Comparison of Part I Scores for Commercial and Non-Commercial Students Matched by Pretest Scores

	N	Part I Mean	Mean of Diff.	S.E. of Diff.	df	t
Commercial	13	522.69	59.62	18.76	12	3.1772*
Non-Commercial	13	463.08				

*p <.005

As in the case with the GPA, the Pretest represents a measure of the students' ability prior to preparation for Part I; and again, commercial students performed significantly better on Part I than did their counterparts with equivalent Pretest scores.

Figure 2 illustrates the best fitting regression line for predicting Part I scores from Pretest scores. The correlation of .80 indicates a good predictor, yet 12 of the 14 commercial students who took the Pretest scored on, or above, the prediction line.

While commercial students tended to increase their scores from Pretest to Part I, non-commercials experienced a significant decrease, and the failing students had a drastic decrease in scores. These data are presented statistically in Table 7 and graphically in Figure 3. Data are presented only for those students who took the Pretest.

Table 7 - Comparison of Pretest Scores With Part I Scores

	N	Mean Pretest	Mean Part I	Mean of Diff.	S.E. of Diff.	df	t
Commercial†	14	483.57	506.43	22.85	15.11	13	1.5124 N.S.
Non-Commercial†	115	528.06	509.57	− 18.50	4.90	114	3.7734**
Failing Students††	8	394.38	304.38	− 90.00	24.12	7	3.7308*

*p <.005

**p <.0005

†Includes failing students

††3 failing students did not take pretest

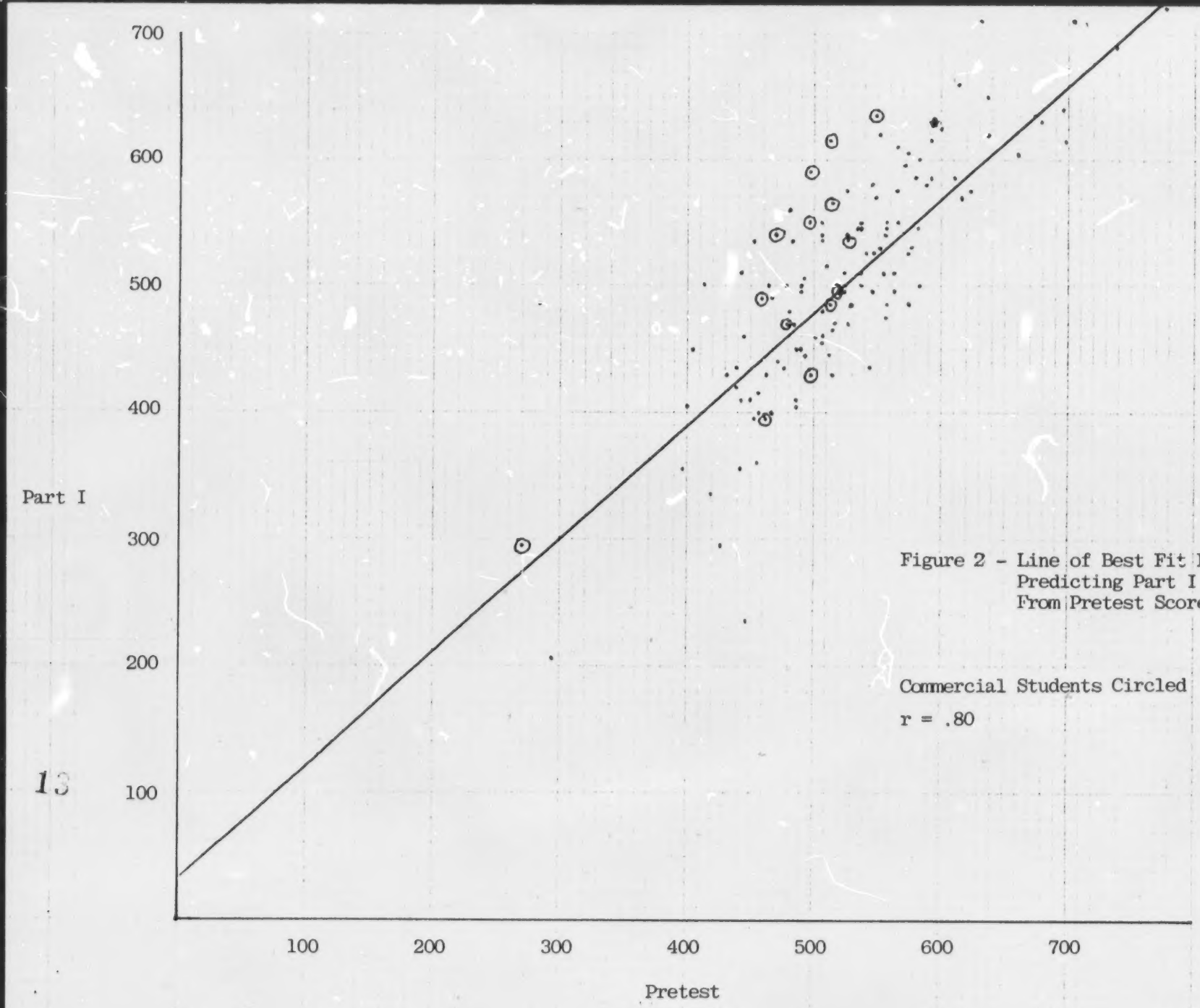
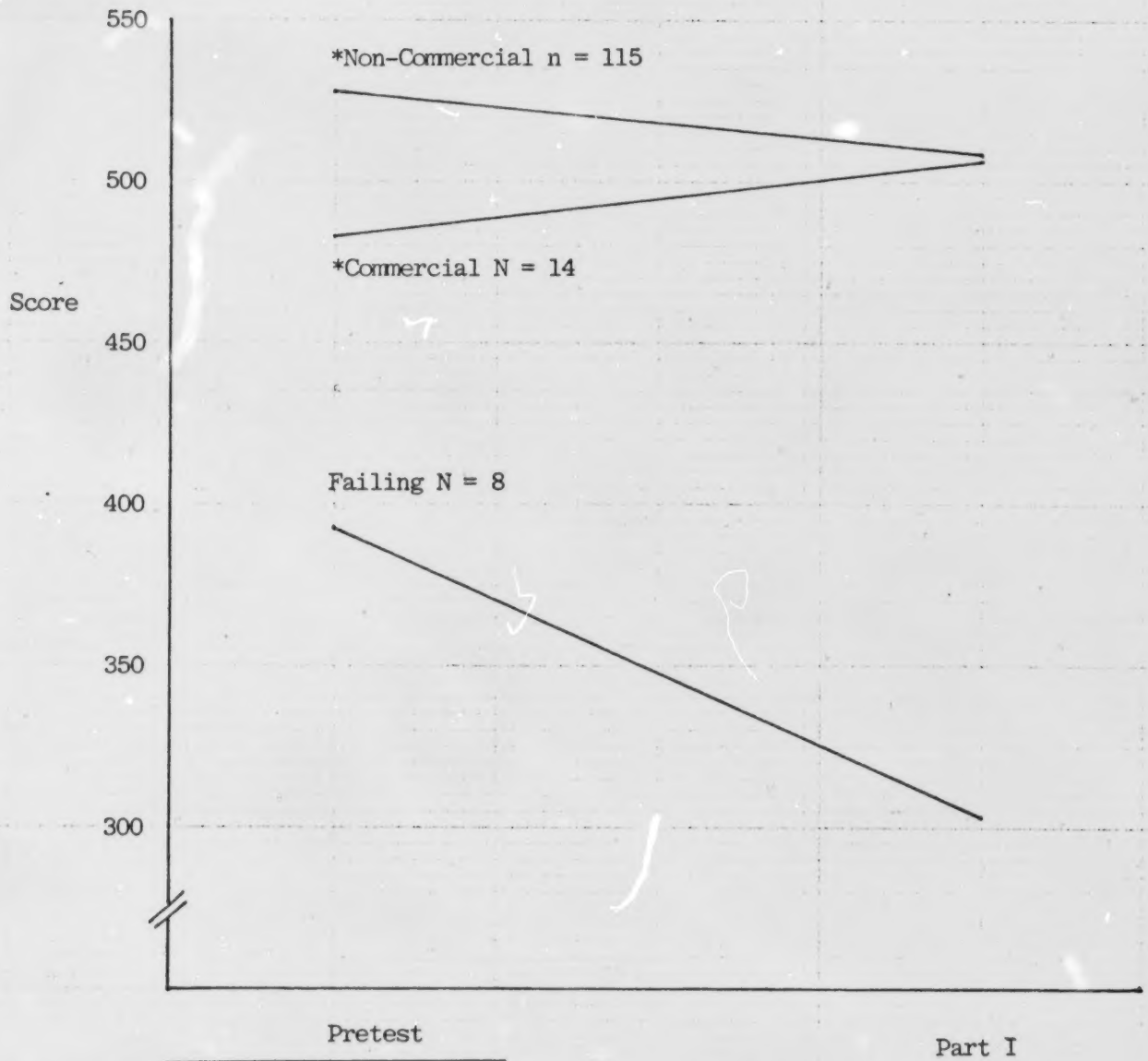


Figure 2 - Line of Best Fit For Predicting Part I Scores From Pretest Scores

Commercial Students Circled

r = .80

Figure 3 - Comparison of Pretest and Part I Scores for Commercial, Non-Commercial, and Failing Students



*Includes failing students

STUDENT SURVEY

It is apparent from the data presented that students taking the commercial course scored significantly higher on Part I of the NBME than did control students matched by GPA and Pretest scores. The question arises therefore as to the most salient features of the commercial course which precipitated this increase in scores.

In order to answer this question, commercial students were surveyed by questionnaire, and selected students were interviewed, to determine their attitudes and observations regarding the course. Thirteen of the seventeen students returned questionnaires, for a response rate of 75%.

Reasons for Taking the Course

The most obvious reason given for taking the $550 course was fear of failing Part I of the NBME. Five students made direct reference to fear of failure and two suggested this problem indirectly. Four students noted that they were overwhelmed by the volume of material to study and, therefore, elected to take the commercial course for its organization of study materials. One student indicated that paying for the course would provide additional motivation to study and the final student said that the took the course in order to score very high on the exam.

Value of the Course

Nine of the 13 responding students said that the course definitely helped them with the exam, and the remaining students indicated that it probably helped. Ten students noted that they would take the course again under similar circumstances, two were not sure, and one definitely would not take the course again.

Students were asked to rate the value of nine features of the course on a

five-point scale. The feature identified as most valuable was the organization of the study materials. It is apparent from the students' comments that the commercial course facilitated the efficient use of their limited study time by organizing the basic science subject matter in such a way that the students were able to concentrate on those points most relevant to the Part I exam. Closely related to content organization was the discipline of study, which the students perceived as being of great value. The commercial course was organized in such a manner as to require the students to successfully answer practice questions before proceeding. This approach tended to ensure a minimal level of competence at each stage of the course. Respondents also agreed that the confidence gained by taking the course, experience with practice tests, and the amount of time devoted to study were highly valuable features of the course.

As might be expected, the motivation provided by paying $550 for the course seemed to be in direct proportion to the student's ability to pay. Two students mentioned this as the single most valuable feature of the course, while three students found it to be of little or no value. The least valuable feature was study with other students. This is understandable inasmuch as the commercial course was self-paced and the students tended to work alone, each according to his individual schedule. Table 8 displays the respondents' ratings for nine features of the course.

Students were also asked to comment on the single most valuable feature of the commercial course. Responses indicate that the greatest value of the course lies in the presentation of material likely to appear on the exam, to the exclusion of irrelevant information. This information was presented in NBME format, thereby familiarizing the students with the various item formats which appear on Part I. The material was organized in such a manner as to concentrate upon information directly relevant to performing well on Part I.

Table 8 - Ratings for Nine Features of the Commercial Course

Item	Mean Rating (5 = great value; 1 = little or no value)
Organization of study materials	4.85
Discipline of study	4.64
Practice tests	4.58
Improved confidence	4.58
Time in study	4.58
Content of materials	4.38
Feedback from tests	4.33
Motivation provided by paying for the course	3.38
Study with other students	2.67

Obviously, the commercial course did not have access to the actual Part I items. However, when asked if the content of the commercial course was directly relevant to the Part I exam, all of the students, except one, responded in the affirmative. The majority of the respondents, however, qualified their answers by noting that some of the course was closely related to some of the items on Part I. The following represents a typical response to the question regarding the relevance of the course content:

> . . .[commercial course] presented material with emphasis as it appeared on the test. . . .[commercial course] covered some relevant material not covered in UAB basic sciences. UAB covered some material not covered by . . .[commercial course].

A more pointed item asked the students if the commercial course presented actual Part I items. Ten of the thirteen respondents said this was, in fact, the case, however, the students qualified their responses by noting that very few Part I items were verbatim from the commercial course. The following

quotations are illustrative of responses to the question, "Did the commercial course present actual Part I items?"

> Yes. Out of the first 10 questions there were about 2 direct hits. After that there were maybe 8-10 on the rest of the exam. I've talked with others who said they saw more but I didn't recognize them.
>
> I noted maybe one or two questions on the whole test that I had actually seen before; but the . . .[commercial] course covered important facts in such detail and taught these facts so well that I was prepared well for the majority of questions by really knowing the facts; not by memorizing answers to questions.

Verbatim items not withstanding, it seems apparent that the content of the commercial course was closely related to the content of the NBME, Part I exam. Student estimates of content similarity from the course to the exam ranged from 10 to 80%, with the majority of respondents indicating that approximately 70% of the Part I concepts were covered in the commercial course.

CONCLUSIONS

The data presented indicate a strong positive influence of the commercial course upon NBME, Part I scores. Three facts may be observed from the objective data:

1. Commercial students scored significantly higher on Part I than did non-commercial students with equivalent basic science GPAs;
2. Commercial students scored significantly higher on Part I than did non-commercial students with equivalent Pretest scores; and,
3. All of the commercial students who were identified as potential failures passed Part I, while 75% of non-commercial students who were potential failures, did, in fact, fail Part I.

The following conclusions may be drawn regarding the the commercial students' observations regarding the course:

1. The majority of the respondents were motivated to take the commercial course out of fear of failure on Part I;

2. The course was appealing to the students because it offered a well organized approach for condensing two years of material into a managable form for study;
3. Students found the organization of study materials to be of great importance because it allowed them to concentrate upon only that information most relevant to the exam;
4. The course covered approximately 70% of the concepts which were on the Part I exam; and,
5. Test-taking techniques was not among the most valuable features of the commercial course.

STRENGTHS AND WEAKNESSES

This study had two primary weaknesses: 1) data were available for only one class and one trial of the commercial course, therefore no generalizations are warranted beyond this trial; and 2) the N of 17 commercial students represents a small sample, thereby limiting the external validity of the study. We believe, however, that the strengths of the study outweigh its weaknesses. The primary strengths were: 1) two good measures of performance (GPA and Pretest) were taken just prior to preparation for Part I, therefore intervening variables were adequately controlled; the only known variable between the GPA/Pretest and Part I was the method of preparation for the exam, commercial or non-commercial; 2) commercial and non-commercial students were successfully matched on both GPA and Pretest; and 3) both the GPA and the Pretest were unbiased pretest measures taken under identical circumstances by all students in the class.

DISCUSSION

Feedback from the commercial students suggests that the commercial course employs some sound educational approaches which are successful, e.g.: instant feedback, self-paced instruction, and multi-media instruction. This study, however, raises the larger question of whether or not the commercial course presented specific NBME information.

The NBME includes a small number of selected, previously used items (approximately 20%) on each exam. These items are included ". . .to increase the efficiency and reliability of the evaluation and to provide a means of assuring equivalency between scores on various administrations of different versions of the examination" (2). The possibility exists, therefore, that the NBME's security may be breached, thereby allowing some students prior access to some exam questions. A recent article in The New Physician indicated that there are, in fact, old copies of the Boards in the hands of students (3). The NBME is aware of this problem and has taken additional steps to tighten the security for the examination (2).

Although the NBME's logic for repeating items is sound, it does allow for the possible exploitation of some students by commercial test preparation companies. We suggest that this possibility would be eliminated if NBME released all exam items each year, thereby giving everyone equal access to a large pool of items. New tests could be constructed by selecting from the better items in the pool and adding approximately 50% new items for each test. This method would preclude any commercial company from unfairly exploiting access to Board items and would not be detrimental to any company whose test preparation is based on sound educational principles.

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